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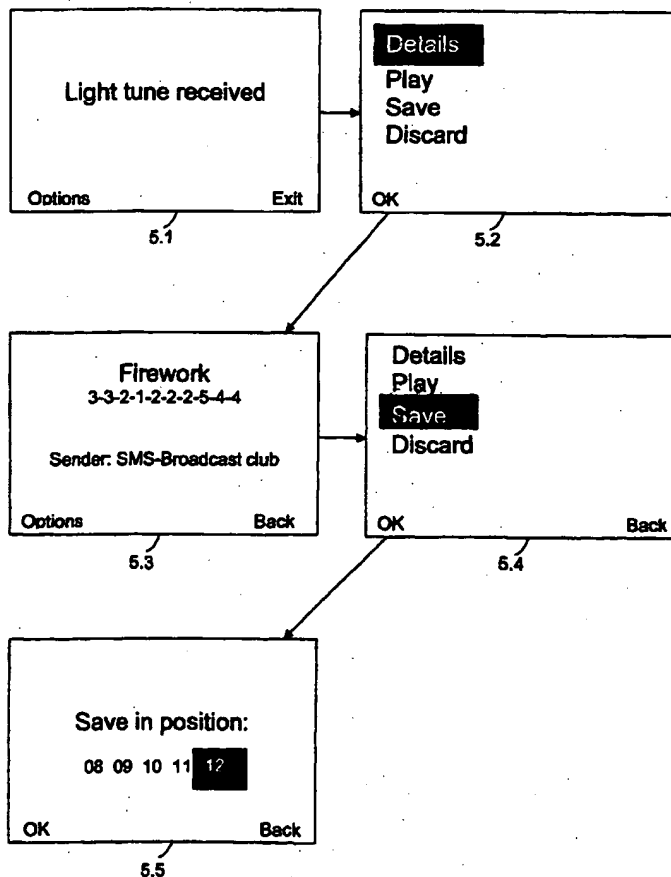
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[Continued on next page]

(54) Title: **MOBILE COMMUNICATION TERMINAL**



(57) Abstract: Mobile communication terminal comprising a plurality of lights, means for controlling the activation of the lights, means for storing a number of sequences of activation of the lights, and means for assigning one of the stored sequences of the activation of the lights to a particular event in the mobile communication terminal.

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## MOBILE COMMUNICATION TERMINAL

5 The present invention relates to mobile communication terminals that comprise a plurality of lights. In particular, the present invention relates to mobile communication terminals in which a sequence for the activation of the lights may be stored. The present invention relates further to a method of composing a sequence of activation of lights on a mobile communication terminal. The present invention relates in particular to a method of composing a sequence of activation of lights on a mobile communication terminal in which said mobile communication terminal comprises a display, a keypad, lights and a memory.

### BACKGROUND ART

15 Mobile communication terminals depend in their functionality highly on the effectiveness of the user interface. One aspect of the user interface is the ability to notify the user. Such notification has in the past mainly been based on audio signals. In recent years the ability to notify the user of incoming calls the user with a vibrator has become popular.

20 GB 2 361 798 discloses a mobile communication terminal in which combinations of display colors or lighting notify an incoming call. The data for changes in lighting is stored in a RAM. A light driver independently drives the plurality of LEDs according to the data stored in the RAM when a call is received.

### DISCLOSURE OF THE INVENTION

30 On this background, it is an object of the present invention to provide a mobile phone of the kind referred to initially, which allows a broader use of user notification through activation of lights. This object is achieved in accordance with claim 1 by providing a memory that can store a plurality of sequences for the activation of lights, and means for selectively assigning a stored sequence to a particular event in the mobile communication terminal. Thus, different events, such as incoming calls, incoming calls from a particular caller or caller group, key lock, key unlock, power on/off,

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calendar alarm, incoming SMS, high score, wake-up alarm, battery status indication and signal strength indication can be assigned a particular lighting sequence.

5 According to an embodiment, the means for selectively assigning one of the stored sequences of the activation of the lights to a particular event in the mobile communication terminal comprises a keypad, a display, and means for displaying on the display an indication which keys of the keypad need to be pressed to assign one of the stored sequences of the activation of the lights to a particular event in the mobile communication terminal.

10 Advantageously, the means for selectively controlling the activation of the lights comprises means for controlling the color of the lights and/or for controlling the intensity level at which the lights are activated. Thus the number of variations in light sequences and the attractiveness of the appearance is improved.

15 The user interface may further comprise means for composing the sequences of activation of the lights. Thus, the user can create his/her personal sequences. Preferably, the means for composing sequences of activation of the lights allows the user to select the intensity level of a light to be activated, preferably as low, middle, 20 high, and/or allows the user to select the duration of the activation of a light to be activated, and/or allows selection of the timing between activations of the lights.

According to an embodiment, the means for composing sequences of activation of the lights comprises a keypad, a display, and means for displaying on the display an 25 indication which keys of the keypad need to be pressed to compose a sequence of activation of the lights.

Advantageously, the sequence of activation of the lights is synchronized with a vibrator of the mobile communication terminal, so that a combined silent signaling is 30 possible.

The mobile communication terminal lights may be LEDs and/or electro luminescent foils and/or electro luminescent strings and/or optical fibers.

35 It is another object of the present invention to provide a mobile communication terminal of the kind referred to initially, which allows a broader use of the lights. This

object is achieved in accordance with claim 11 by providing the mobile communication terminal with means for transforming an audio signal into a control signal for activation of the lights.

- 5 Advantageously, the audio signal is provided by a microphone in the mobile communication terminal, and/or by a digital audio player in the mobile communication terminal and/or by a radio in the mobile communication terminal and/or by a memory in the mobile communication terminal in which ringing tunes are stored. With the microphone activated, e.g. in a discotheque or other place where music is played, the  
10 mobile communication terminal can be used as a light organ.

- Advantageously, the audio signal is divided into two or more discrete frequency bands by filters, and the output of the filters is used to activate the lights, preferably with a light with a different color being assigned to each frequency band, and/or the  
15 intensity of the lights being modulated according to the output level from the filter driving the light. Thus, the light effects in response to the audio signal become more sophisticated.

- The mobile communication terminal may also comprise means for recording and  
20 storing the activation of the lights in response to the audio signal. Thus, the user does not have to download or enter the sequences of activation of the lights, but may simply record, store and assign them to different events. Preferably, the intensity level during the activation of a light is also recorded.

- 25 It is another object of the present invention to provide a method of composing a sequence of activation of lights on a mobile communication terminal of the kind referred to initially. This object is achieved in accordance with claim 18 by providing a method comprising the steps of:

- displaying on the display a menu in which the activity of composing of a sequence  
30 of activation of lights can be selected by pressing one or more keys of the keypad, and when such keys have been pressed,
- displaying on the display a menu in which the sequence of the activations of lights can be composed by pressing one or more keys of the keypad, and
- storing the composed sequence of the activation of lights.

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According to a preferred embodiment, the method further comprises the step of displaying on the display a menu in which the color and/or intensity in which the lights are to be activated can be selected by pressing one or more keys of the keypad.

- 5 The method may further comprise the step of displaying on the display a menu in which the duration of an activation one of the lights can be selected pressing one or more keys of the keypad. Advantageously, the method may further comprise the step of displaying on the display a menu in which a sequence of activation of lights can be saved to the memory by pressing one or more keys of the keypad.

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- According to another preferred embodiment, the method further comprises the step of displaying on the display a menu in which a stored sequence of activation of lights can be retrieved from the memory by pressing one or more keys of the keypad. Advantageously, the method may further comprise the step of displaying on the display a menu in which the assignment of one of the stored sequences of activation of lights to a particular event in the mobile communication terminal can be selected by pressing one or more keys of the keypad. Advantageously, the method may further comprise the step of displaying on the display a menu in which a stored sequence of activation of lights can be sent to another mobile communication terminal by pressing one or more keys of the keypad.

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- It is another object of the present invention to provide a method of assigning a sequence of activation of lights on a mobile communication terminal to a particular event in the communication terminal. This object is achieved in accordance with claim 25 by providing a method of assigning a sequence of activation of lights on a mobile communication terminal to a particular event in the communication terminal, wherein the mobile communication terminal comprises, a display, a keypad, lights and a memory in which at least one sequence of activation of lights is stored, comprising the steps of:

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- displaying on the display a menu in which the activity of assigning a sequence of activation of lights to a particular event in the mobile communication terminal can be selected by pressing one or more keys of the keypad, and when such keys have been pressed,
- displaying on the display a menu in which the assignment of one of the stored sequences of activation of lights to a particular event in the mobile communication terminal can be selected by pressing one or more keys of the keypad, and when

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such keys have been pressed, assigning the one stored sequence of activation of lights to the particular event.

It is another object of the present invention to provide a cover for removable attachment to a mobile phone, which allows broader use of user notification through activation of lights. This object is achieved in accordance with claim 26 by providing a removable cover comprising a plurality of lights, a connector for establishing an electrical connection to a counterpart on the mobile phone, and electric wiring connecting the connector with the plurality of lights.

Preferably, the plurality of lights comprises one or more electro luminescent elements. The electro luminescent elements may be foils and/or wires.

The electro luminescent foils may be divided in a plurality of segments that can be individually activated.

The electro luminescent foils may be provided with a two-dimensional wire net, whereby preferably parts of said two-dimensional wire net can be activated individually.

Two or more electro luminescent foils may be placed one above another, with the upper electro luminescent foil or foils preferably being more transparent to light than the lower electro luminescent foil or foils, whereby preferably each electro luminescent foil emits light of different color.

The connector preferably comprises at least connecting members for voltage, ground and control.

Further objects, features, advantages and properties of the mobile communication terminal according to the invention will become apparent from the detailed description.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

In the following detailed portion of the present description, the invention will be explained in more detail with reference to the exemplary embodiments shown in the drawings, in which:

- Fig. 1a is a diagrammatic view on a mobile communication terminal according to the invention,
- Fig. 1b is a view form on the back of a front cover with integrated lights,
- Fig. 1c is an perspective view on a back cover with integrated lights,
- Fig. 1d is a flow chart illustrating the operation of the mobile communication terminal, and
- Figs. 2 to 6 are screen shots illustrating the operation of the user interface in a flow chart manner.

## **DETAILED DESCRIPTION**

In the following detailed description, a mobile communication terminal according to the invention in the form of a hand portable phone, preferably a cellular/mobile phone, will be described by the preferred embodiments.

Fig. 1 shows a preferred embodiment of a mobile phone according to the invention, and it will be seen that the mobile phone, which is generally designated by 1, comprises a user interface having a keypad 2, a display 3, an earpiece 5, and a microphone 6. The keypad 2 has a set of keys 7 for entering data. These keys 7 are in the form of alphanumeric keys, by means of which the user can enter numbers and letters, e.g. a phone number, a text message (SMS) or a name (associated with the phone number). The user uses the first group of keys primarily for entering data in the phone (entry events).

In the preferred embodiment, the keypad 2 additionally comprises two multi-functionality keys 8,8', so-called soft keys, whose function depends on the present state of the mobile phone 1. The default function or the present function of the multi-functionality keys 8,8' is displayed in separate fields 11,11' below a basic screen area 12 of the display 3. Information entered by said data entering keys and information



received from the network are displayed in the basic screen area 12. In the preferred embodiment, the keypad additionally comprises a scrolling device which, in the preferred embodiment, is provided as scroll keys 9,9' for moving a cursor or a cursing bar in two opposite directions. By means of the scroll keys 9,9', the user can jump  
5 selectively from one item to the preceding or the succeeding item in the menu loop of the mobile phone 1, while he gets access to a submenu loop under the item concerned in the main menu loop by activation of the multi-functionality keys 8,8'. The call answer key 10 may be used for initiating a call, and the call end key 10' may be used to end a call. The use of multi-functionality keys 8,8' and the scroll keys 9,9'  
10 may advantageously be redefined in some states display. The user interface allows thus selection of a variety of available functions e.g. phone book, call register, settings, messages, etc. This user interface is as such known from US patent 6,195,569, hereby incorporated by reference.

15 The mobile phone 1 is provided with a number of lights for indicating events in the mobile phone 1. The keypad 2 and the display 3 are each provided with a backlight using an as such conventional combination of LEDs and electro luminescent foil (not shown). Instead of LEDs outcoupling points of a lightguide can be used wherever LEDs are mentioned in this document. The keypad 7 is provided with a green electro  
20 luminescent foil, whereas the display 3 is provided with a white electro luminescent foil. Further, the mobile phone 1 is equipped with a number of bi-color LEDs, 4,4',13,13',16,18 that are directly visible from the outside. The left side group 4 comprises 3 LEDs that light either in red or in blue. The right side group 4' comprises 3 LEDs that light either in red or in green. A central group of LEDs 13,13' lights either  
25 in orange or in blue. A green LED 16 is integrated in the answer key 10. The group of LEDs 18 on the top of the phone has different colors. Above the display 3, two LEDs (not shown) are provided behind a transparent window 15. The window 15 is shaped as letters that form the word Nokia. The LEDs behind the window 15 either light in red or in yellow. Other keys can be provided with an LED or other light source (not  
30 shown) these lights can be used to e.g. show the user the key sequence for unlocking the keylock, or to indicate that the caps lock is on.

An electro luminescent foil 14 is provided above the display 3. The electro luminescent foil 14 is divided in nine segments that can individually be activated.  
35 Within each segment, a two-dimensional wire net allows shapes or patterns to be displayed. In the present preferred embodiment the electro luminescent foil 14

comprises a segment with a plurality of concentrically arranged triangularly shaped wire nets. The triangularly shaped wire nets can be activated one after another to obtain an animation affect. The other eight segments of the electro luminescent foil 14 comprise different patterns that allow other animation effects such as a beating heart, rotating stars etc. The animation effects can be obtained by controlling the sequence of activation and the intensity and duration of the activation. In a preferred embodiment two electro luminescent foils are placed one over another, with the upper foil being more transparent to light. The colors of the light emitted by the two foils preferably being different, e.g. the upper foil emitting a yellow light and the lower foil emitting red light. When both foils are activated, the combined light will appear as orange to an observer. By varying the intensity of the light emitted by each of the foils the color perceived by an observer may be gradually varied from yellow via orange to red.

According to a preferred embodiment, the lights are arranged on an exchangeable/removable front or back cover of the mobile phone. These type of covers are as such well known from e.g. the Nokia® 3310 mobile phone. Fig. 1a is a view from the rear on a front cover 17. The cover is provided with connector 19 which comprises a plurality of electrical contacts such as voltage, ground and control for the lights on the cover. Electric wiring is moulded into the front cover 17 for connecting the lights 4,4',13,13',14 and 15 with the connector 19. The connector 19 has a not shown counter part on the core housing of the mobile phone.

Fig. 1b illustrates a back cover 20 provided with an electro luminescent foil 21. The electro luminescent foil 21 is preferably moulded into the rear cover 20. An electrical connector (not shown) for ground, voltage and control is provided on the side of the rear cover facing the core housing of the mobile phone. The electro luminescent foil 21 is divided into four segments that can individually be activated and for each of the segments two dimensional wire nets may be provided in a manner as shown for electro luminescent foil 14.

According to a preferred embodiment (not shown) the electro luminescent foil covers substantially the complete front cover with the exception of the display area and the openings for the keys. In case of a completely transparent electro luminescent foil, also the display area could be covered by the electro luminescent foil. The electro luminescent foil may be attached to the cover by different techniques such as integral

moulding, applying adhesive, heat bonding etc. The tracks for the electric wiring can advantageously be shaped so as to form a desired design pattern that improves the appearance of the phone. In another preferred embodiment (not shown) the electro luminescent foil covers substantially the complete back cover. Also in this  
5 embodiment the tracks for the electric wiring may be arranged to form a desired design pattern that improves the appearance of the phone.

The mobile phone 1 is provided with an in build vibrator (not shown).

10 The mobile phone 1 comprises as such conventional hardware (not shown) including a microprocessor and related hardware such as RAM, ROM and ports for controlling and exchanging data in the mobile phone 1. A memory in the mobile phone 1 contains the data for sequences of activation of the lights. The term "sequence" used hereafter refers to a sequence of activation the lights. Each stored sequence  
15 comprises the data for timing, intensity and color of a light or a group of lights. The lights are activated by a L-driver (not shown). The L-driver can also activate the vibrator. The L-driver receives stored sequences from the memory and controls activation, color and intensity of the lights. As illustrated in Fig 1d, when an event occurs (Step 201), a check is made if a sequence of activating the lights is assigned  
20 to the particular event (Step 202). An event is e.g. an incoming call, an incoming call from a particular caller or caller group, a key lock, a key unlock, a power on/off, a calendar alarm, an incoming SMS, a high score, a wake-up alarm, a battery status indication or a signal strength indication. If a sequence is assigned to the detected event, the sequence will be retrieved from the memory (Step 203) and the L-driver  
25 will generate a signal powering the lights accordingly (Step 204). The microprocessor also controls the activation of the vibrator through the L-driver. The activation of the vibrator may be assigned to an event and is synchronized with any light sequences assigned to the event. Stored sequences assigned to events that will only require the sequences to be played once, such as an incoming SMS will contain an end signal,  
30 thus, ending playing when the sequence has been played once. Sequences assigned to events in which the sequence should be repeated until another event occurs, such as an incoming call, where repeated playing of the sequence must not stop before either the call answer key 10 is pressed or the call is ended, will be played until a signal to end playing the sequence is received, e.g. when the 10 answer key is  
35 pressed in response to an incoming call.

According to a preferred embodiment the sequences are designed to support the user interface. Thus, a specific pattern or sequence of the lights can help a user to understand i.e. that a call has been received from a certain person or an SMS with specific content has been received. For example the LED 16 in the answer key 10 can flash when a call is received. This will help visually impaired persons to find the answer key. The remaining lights could be used to form a pattern or color code that identifies the caller.

A method for composing a sequence through the user interface of the mobile phone 1 will be described below with reference to Figs. 2 to 5. In Figs 2 to 5 the actual text displayed on the display 3 is depicted. In the user interface, a sequence of activation of the lights is referred to as a "light tune". Therefore the term "light tune" in Figs. 2 to 5 corresponds to the term "sequence for the activation of the lights in this text.

To enter the user interface menu, the multi-functionality key 8 "Menu" is pressed (state 2.1). The "Light tunes" sub menu is selected by using the scroll buttons 9,9' to browse through the submenus and pressing the multi-functionality key 8 "Select" again (state 2.2). The display 3 lists the possibility to personalize or to activate sequences (state 2.3). By using the scroll keys 9,9' and selecting "Personalize" by pressing the multi-functionality key 8 "Options", the next state is displayed (state 2.4). In this state, the display 3 lists the events to which the sequence will be assigned. Using the scroll keys 9,9' and the multi-functionality key 8, the event is selected. The user interface requests to choose between composing or retrieving a sequence. If "Retrieve" is selected the next state of the display is shown in Fig. 4 (state 4.1), which will be described further below.

If "Compose" is selected, the next state of the display 3 is shown in Fig. 3 (state 3.1). In this state the display 3 shows a list indicating which of the lights, or group of lights, and if available, also the color in which they are to be activated is assigned to a particular alphanumerical key 7 of the keypad 2. Thus, e.g. an activation of the left side LED group 4 in red is added to the sequence by pressing the corresponding alphanumerical key 7, in this case the alphanumerical key 7 on which the number 3 (not shown) is indicated. The sequence entered so far is displayed in the black horizontal bar at the lower part of the display 3. By pressing the respective alphanumerical key 7 a next light or group of lights is added to the sequence. The user interface will prompt in the next state to select the intensity (referred to by the user interface as "Brightness" (state 3.2). When the intensity has been selected using

the scroll keys 9,9' and the multi-functionality key 8 "OK", the user interface will prompt to select further attributes for the type of activation, such as "Normal", "Ramp up", "Ramp down", "Full power", "Intermittent" or "Isophase". When the attributes have been selected, using the multi-functionality key 8 "OK", the user interface will prompt to select the length of the activation of the selected light or group of lights. By pressing multi-functionality key 8' "Options" a further submenu of the user interface (not shown) allows the activation length to be user-specified by entering a numerical value using the alphanumerical keys 7 on the keypad 2. When the length of the activation has been selected, the display returns to state 3.1. Erroneously entered numbers in the sequence can be deleted by pressing the multi-functionality key 8' "Clear". When the sequence is completed, pressing the multi-functionality key 8 "OK" changes the state of the display 3 to allow playing (i.e. play the sequence before saving), saving or discarding the sequence (state 3.4). To save the sequence "Save" is selected from the submenu and pressing the multi-functionality key 8 "OK" results in the user interface prompting for entering a name for the sequence to be stored (state 3.5). After entering a name using the alphanumerical keys 7 of the keypad 2, the sequence will automatically be saved in one of the free memory positions. If there are no free memory positions the user interface will prompt for selecting a position to overwrite (state 3.6).

When in state 2.5 of the user interface (Fig. 2) "Retrieve from library" is selected, the next state of the user interface lists the stored sequences and prompts to select one by using the scroll keys 9,9' and pressing the multi-functionality key 8 "Assign" to assign the selected sequence to the previously selected event (state 4.1). By pressing the multi-functionality key 8' "Options", the user interface turns to state 4.2, allowing browsing with the scroll keys 9,9' through the options "Play", "Send", "Edit", "Discard" and "Rename". Selecting "Play" allows to play the sequence before assigning it to the preselected event. Selecting "Rename" allows the name assigned to the sequence to be changed. Selecting "Send" and pressing the multi-function key 8 "OK" the user interface will prompt for a phone number to send the channel setting to (state 4.3). After entering the number with the alphanumerical keys 7 the display area above the multi-function key 8 changes to "OK" (state 4.4). After pressing the multi-functionality key 8 "OK" the message will be sent (state 4.5). Alternatively, the phone number can be recalled from the phone book by pressing the multifunction key "Search" (state 4.3). The following phone number selection procedure from the in build phone book is not explained here, and is well known from e.g. the Nokia® 6210

mobile phone and the Nokia® 6210 User Manual which is hereby incorporated by reference. While the message is being sent, the user interface will display "Sending light tune" (state 4.6). The user still has a chance to interrupt the transmission by pressing the multi-function key 8 "Cancel". By selecting "Edit" in state 4.2 the user interface turns to state 3.1 so that the stored sequence may be edited before assigning it to the preselected event.

Text messages, such as SMS-messages, are a useful extension of the use of mobile phones. The technical specifications for the GSM Short Message Service are defined in: ETSI TS 100 901 V7.4.0 (1999-12), Technical Specification, Digital cellular telecommunications system (Phase 2+); Technical realization of the Short Message Service (SMS); (GSM 03.40 version 7.4.0 Release 1998), hereby incorporated by reference. The messages may contain plain text, ringing tones, picture messages, WAP settings and business cards (Vcard). The type of message is coded in the user data header. The user data header is indicated in the first octet of the SMS-Submit TPDU (with message parameter value).

According to the present invention, a message sent to a mobile phone 1 contains a sequence of activation of lights, a "light tune". Upon receipt of a text message containing a sequence of activation of lights, the user interface will display a soft notification "Light tune received" Fig. 5, state 5.1. Upon pressing the multi-functionality key 8 "Options", the user interface displays the options "Details", "Play", "Save" and "Discard" (state 5.2). By using the scroll keys 9,9' the user can select either of these four options. Selecting "Details" and pressing the multi-function key 8 "OK" will result in the display listing the activation sequence (state 5.3). By pressing the multi-functionality key 8 "Options" the display 3 will show further details such as color, intensity etc. (not shown). By pressing the multi-functionality key 8 "Back" the display 3 turns to state 5.4. By selecting "Play" the sequence can be played before saving. By selecting "Save" and pressing the multi-functionality key 8 "OK" the channel will automatically be saved in one of the free memory positions. If there are no free memory positions, the user interface will prompt for selecting a memory position to overwrite (state 5.5).

According to another preferred embodiment, the mobile phone is able to communicate via the so-called wireless application protocol (WAP). Like any other data set, sequences for the activation of lights may be downloaded to the mobile

phone 1 from WAP servers. The downloaded sequences may be stored in the memory and assigned to an event as shown above.

According to another preferred embodiment, the mobile phone 1 is provided with  
5 signal processor that transforms an audio signal into a control signal for activation of the lights. The audio signal is divided into two or more discrete frequency bands by filters, and the output of the filters is supplied as a signal to the Light driver (L-driver) to activate the lights, with a light with a different color or placement or shape being assigned to each frequency band. The intensity of the lights may be modulated  
10 according to the output level from the filter. Thus, the light effects in response to the audio signal become more sophisticated. The signal processor may be programmed to limit the minimum duration of an activation of a light, to avoid a perception by observers of lights that flicker when the transformed audio signal would without this precaution result in a very short activation of the light. Similarly, the maximum  
15 duration of an activation of a light may be limited, to avoid continuous, or almost continuous activation of a light.

The source of the audio signal can be selected through the user interface. When source of audio signal is the microphone 6, the mobile phone 1 will function as a light  
20 organ in locations where there is music or other rhythmic ambient sound. According to another preferred embodiment, the mobile phone 1 comprises a digital audio player and a radio, which can be selected as the source for the audio signal. Also, the ringing tunes stored in a memory of the mobile phone 1 can be selected as an audio signal supplied to the signal processor. The signal processor may be realized  
25 in as hardware or as software. In the latter case, the software could be a downloaded JAVA application run on the mobile phone.

The light organ settings and functions can be modified by the user through the user interface as explained below.

30 After selecting "Light organ" from the main user interface menu (state 2.2), the user interface turns to state 6.1. The display 3 shows the options "Activate", "Settings" and "Record tune". Using the scroll keys 9,9' and the multi functionality key 8 the user can select "Settings" to arrive at state 6.2. In this state the user is prompted to select the audio source or the frequency ranges. Selecting "Audio source" results in state 6.3, in  
35 which either the microphone, the radio or the audio player can be selected as audio source. Selecting "Frequency ranges" in state 6.2 results in state 6.4. In this state the

user is prompted to select one of the three frequency ranges where after one of the lights may be assigned to the selected frequency range in state 6.6. Upon pressing the multi functionality key 8 "Options" in state 6.4, a non-shown state allows the user to personalize the frequency bands, and to increase or decrease the number of  
5 frequency bands.

Mobile phone 1 comprises a memory and circuitry for recording and storing the activation of the lights in response to the audio signal. Thus, the user does not have to download or enter the sequences of activation of the lights, but may simply record,  
10 store and assign them to different events. Preferably, the intensity level during the activation of a light is also recorded. Selecting "Record tune" in state 6.1 starts the recording and results in state 6.5. In state 6.5 the recording can be ended by pressing multi functionality key 8 "End".

15 Although the invention is shown with preferred embodiments that use two multi-functional keys, it is evident that the invention can also be carried out with only one or without any multi-functional functional key. The lights shown in the preferred embodiment are merely an example of lights that may be used to carry out the invention. It is evident that many other lights and light-guiding elements may be used  
20 as an alternative. The type of lights, their color shape and location shown in the above exemplary embodiments are not to be interpreted as limiting for the invention. Any location, shape, color of lights or can used with the present invention. For example the electro luminescent foils may be replaced by any different shaped electro luminescent element such as an electro luminescent wire. Electro  
25 luminescent elements are available in a number of basic colors, based on several different dyes. By mixing dyes any color can be obtained, at any place on the mobile phone.



**CLAIMS:**

1. A mobile communication terminal comprising a plurality of lights, means for controlling the activation of said lights, means for storing a number of sequences of activation of said lights, and means for selectively assigning one of said stored sequences of the activation of said lights to a particular event in said mobile communication terminal.
2. A mobile communication terminal according to claim 1, wherein said means for selectively assigning one of said stored sequences of the activation of said lights to a particular event in said mobile communication terminal comprises a keypad, a display, and means for displaying on said display an indication which keys of said keypad need to be pressed to assign one of said stored sequences of the activation of said lights to a particular event in said mobile communication terminal.
3. A mobile communication terminal according to claim 1 or 2, wherein said means for controlling the activation of said lights comprises means for controlling the color of said lights and/or for controlling the intensity level at which said lights are activated.
4. A mobile communication terminal according to any of claims 1 to 3, further comprising means for composing said sequences of activation of said lights.
5. A mobile communication terminal according to claim 3 or 4, wherein said means for composing sequences of activation of said lights comprises a keypad, a display, and means for displaying on said display an indication which keys of said keypad need to be pressed to compose a sequence of activation of said lights.
6. A mobile communication terminal according to any of claims 3 to 5, wherein said means for composing sequences of activation of said lights allows the user to select the intensity level of a light to be activated, preferably as low, middle, high, and/or allows the user to select the duration of the activation of a light to be activated, and/or allows selection of the timing between activations of said lights.
7. A mobile communication terminal according to any of claims 3 to 6, wherein said means for composing sequences of activation of said lights comprises a keypad, a display, and means for displaying on said display an indication which keys of said

keypad need to be pressed to select the intensity level of a light to be activated, preferably as low, middle, high, and/or which keys need to be pressed to select the duration of the activation of a light to be activated, and/or which keys need to be pressed to select of the timing between activations of said lights.

5

8. A mobile communication terminal according to any of claims 1 to 7, wherein said events can be selected from the group comprising, incoming call, incoming call from a particular caller or caller group, key lock, key unlock, power on/off, calendar alarm, incoming SMS, high score, wake-up alarm, battery status indication and signal strength indication.

10

9. A mobile communication terminal according to any of claims 1 to 8, wherein the sequence of activation of said lights is synchronized with a vibrator of said mobile communication terminal.

15

10. A mobile communication terminal according to any of claims 1 to 9, wherein said lights comprise LEDs and/or electro luminescent foils and/or electro luminescent strings and/or optical fibers.

20

11. A mobile communication terminal according to any of claims 1 to 10, further comprising means for playing the stored sequence before assigning the sequence to an event.

25

12. A mobile communication terminal comprising a plurality of lights, means for controlling the activation of said lights and means for transforming an audio signal into a control signal for activation of said lights.

30

13. A mobile communication terminal according to claim 12, wherein said audio signal is provided by a microphone in said mobile communication terminal and/or by a digital audio player in said mobile communication terminal and/or by a radio in said mobile communication terminal and/or by a memory in said mobile communication terminal in which ringing tunes are stored.

35

14. A mobile communication terminal according to claim 12 or 13, wherein said audio signal is divided into two or more discrete frequency bands by filters, and the output of said filters is used to activate said lights, preferably with a light with a different

color being assigned to each frequency band, and/or the intensity of said lights being modulated according to the output level from the filter driving the light.

5 15. A mobile communication terminal according to any of claims 12 to 14, further comprising means for recording and storing the activation of said lights in response to said audio signal.

16. A mobile communication terminal according to claim 15, wherein the intensity level and/or color during the activation of a light is recorded.

10

17. A mobile communication terminal according to claim 15 or 16, further comprising means for assigning a recorded and stored sequence of the activation of said lights to a particular event in said mobile communication terminal.

15 18. A mobile communication terminal according to any of claims 12 to 17, wherein at least a part of said plurality of lights is integrated in a removable cover.

19. A method of composing a sequence of activation of lights on a mobile communication terminal, wherein said mobile communication terminal comprises  
20 a display, a keypad, lights and a memory, comprising the steps of:

- displaying on said display a menu in which the activity of composing of a sequence of activation of lights can be selected by pressing one or more keys of said keypad, and when such keys have been pressed,
- displaying on said display a menu in which the sequence of the activations of lights  
25 can be composed by pressing one or more keys of said keypad, and
- storing the composed sequence of the activation of lights.

20. A method according to claim 19, further comprising the step of:

- displaying on said display a menu in which the color and/or intensity in which said  
30 lights are to be activated can be selected by pressing one or more keys of said keypad.

21. A method according to claim 19 or 20, further comprising the step of:

- displaying on said display a menu in which the duration of an activation one of said  
35 lights can be selected pressing one or more keys of said keypad.

22. A method according to any of claims 19 to 21 , further comprising the step of:

- displaying on said display a menu in which a sequence of activation of lights can be saved to said memory by pressing one or more keys of said keypad.

5 23. A method according to any of claims 19 to 22, further comprising the step of:

- displaying on said display a menu in which a stored sequence of activation of lights can be retrieved from said memory by pressing one or more keys of said keypad.

24. A method according to any of claims 19 to 23, further comprising the step of:

10 - displaying on said display a menu in which the assignment of one of the stored sequences of activation of lights to a particular event in said mobile communication terminal can be selected by pressing one or more keys of said keypad.

25. A method according to any of claims 19 to 24, further comprising the step of:

15 - displaying on said display a menu in which a stored sequence of activation of lights can be send to another mobile communication terminal by pressing one or more keys of said keypad.

26. A method according to any of claims 18 to 25, further comprising the step playing  
20 the composed sequence before storing.

27. A method of assigning a sequence of activation of lights on a mobile communication terminal to a particular event in said communication terminal, wherein said mobile communication terminal comprises a display, a keypad, lights and a  
25 memory in which at least one sequence of activation of lights is stored, comprising the steps of:

- displaying on said display a menu in which the activity of assigning a sequence of activation of lights to a particular event in said mobile communication terminal can be selected by pressing one or more keys of said keypad, and when such keys have  
30 been pressed,

- displaying on said display a menu in which the assignment of one of the stored sequences of activation of lights to a particular event in said mobile communication terminal can be selected by pressing one or more keys of said keypad, and when such keys have been pressed, assigning said one stored sequence of activation of  
35 lights to said particular event.

28. A method according to claim 27, further comprising the step of playing the sequence before assigning it to the particular event.

29. A cover for removable attachment to a mobile phone, comprising a plurality of  
5 lights, a connector for establishing an electrical connection to a counterpart on said mobile phone, and electric wiring connecting said connector with said plurality of lights.

30. A cover according to claim 29, wherein said plurality of lights comprises one or  
10 more electro luminescent elements.

31. A cover according to claim 29 or 30, wherein said electro luminescent elements are foils and/or wires.

32. A cover according to any of claims 29 to 31, wherein said one or more electro  
15 luminescent foils are divided in a plurality of segments that can be individually activated.

33. A cover according to any of claims 29 to 32, wherein said one or more electro  
20 luminescent foils are provided with a two-dimensional wire net, whereby preferably parts of said two-dimensional wire net can be activated individually.

34. A cover according to any of claims 29 to 33, wherein two or more electro  
luminescent foils are placed one above another, with the upper electro luminescent  
25 foil or foils preferably being more transparent to light than the lower electro luminescent foil or foils.

35. A cover according to claim 34, wherein the each electro luminescent foil emits  
light of a different color.

36. A cover according to any of claims 29 to 35, wherein said connector comprises at  
30 least connecting members for voltage, ground and control.

37. A cover according to any of claims 29 to 36, wherein said plurality of lights  
35 comprises one or more LEDs.

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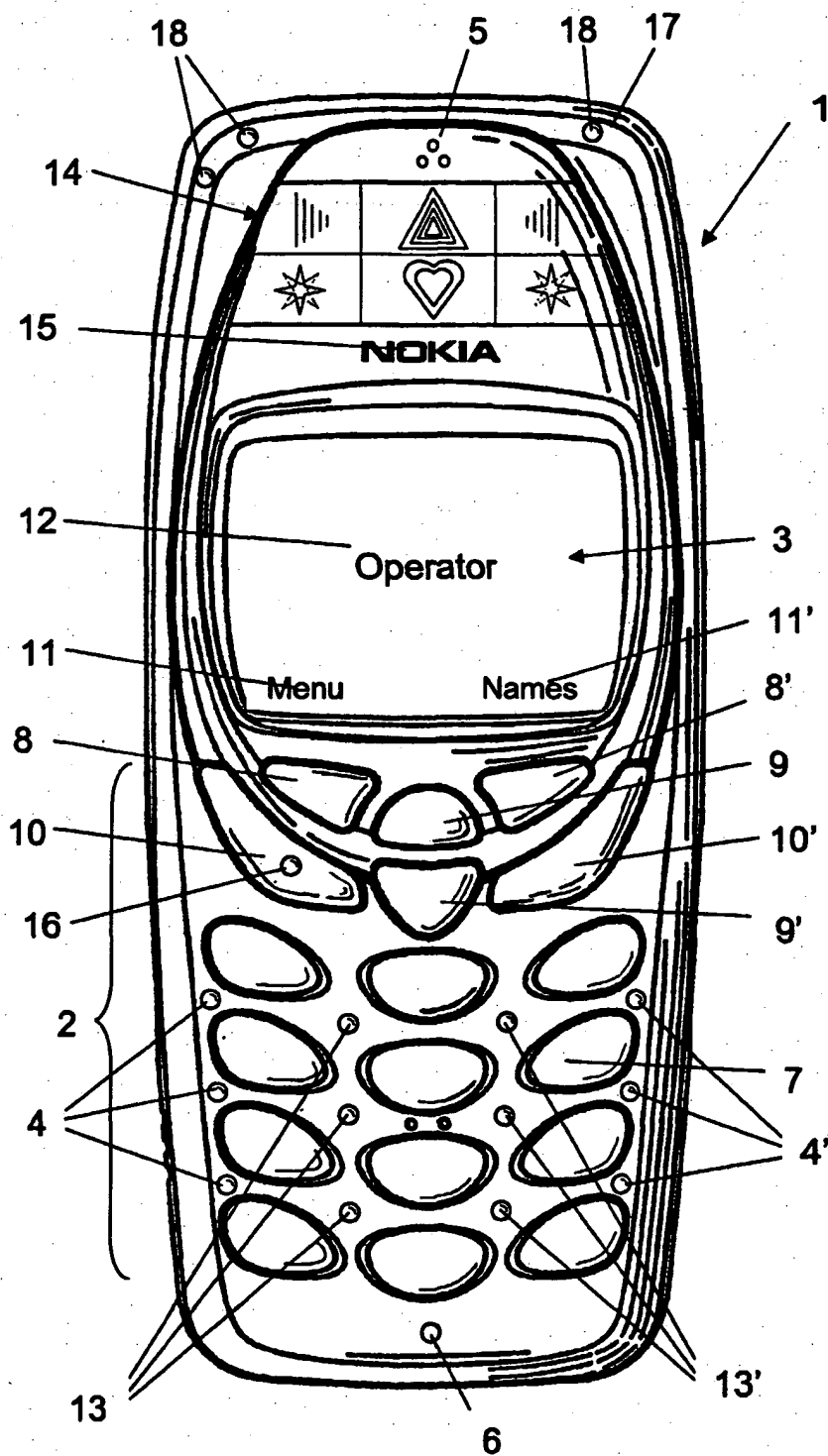
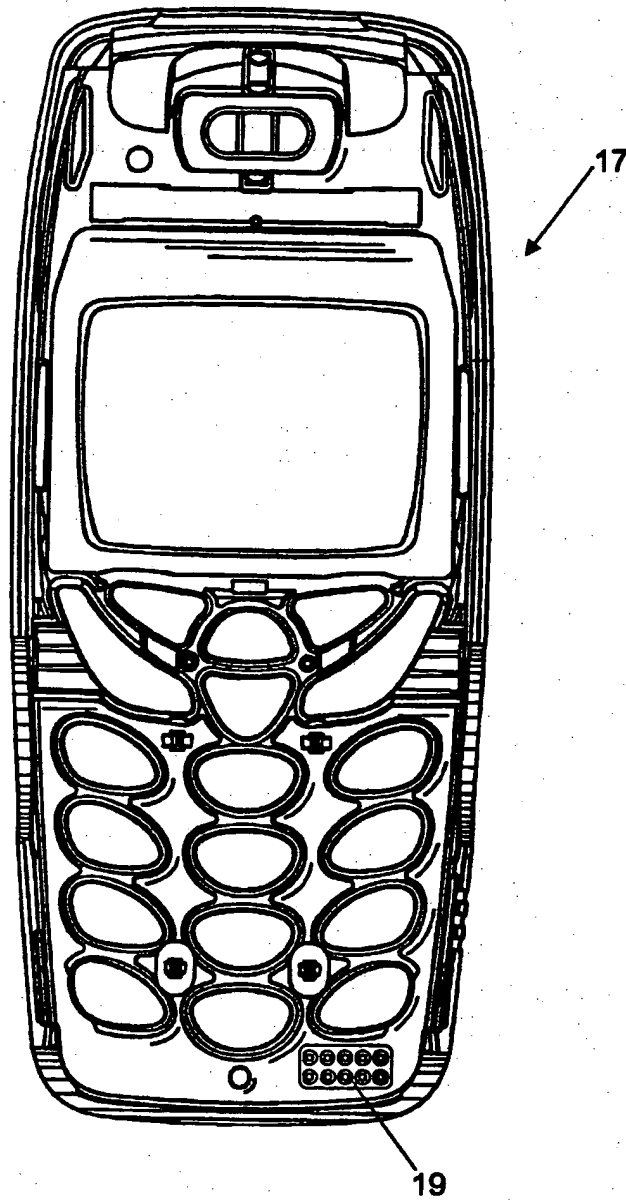
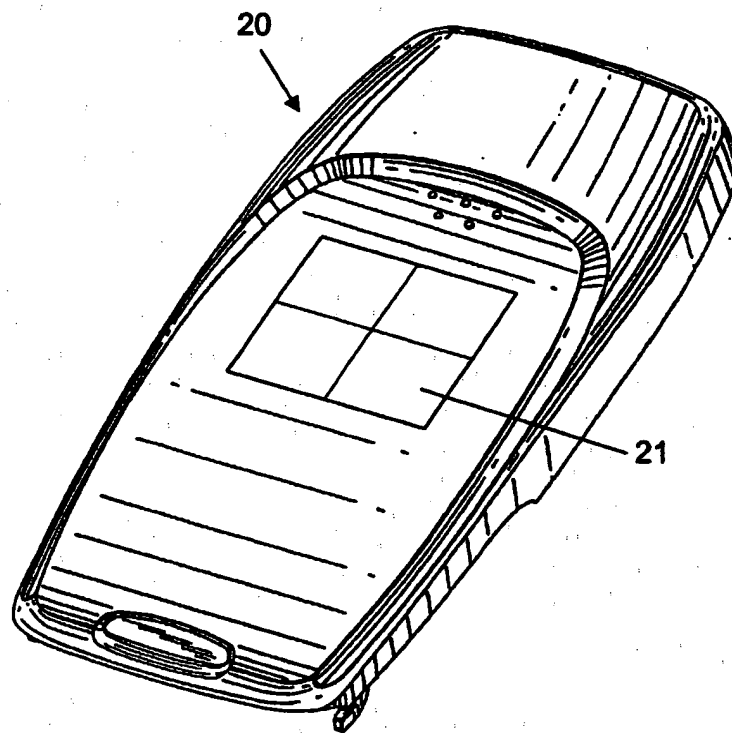


Fig. 1a

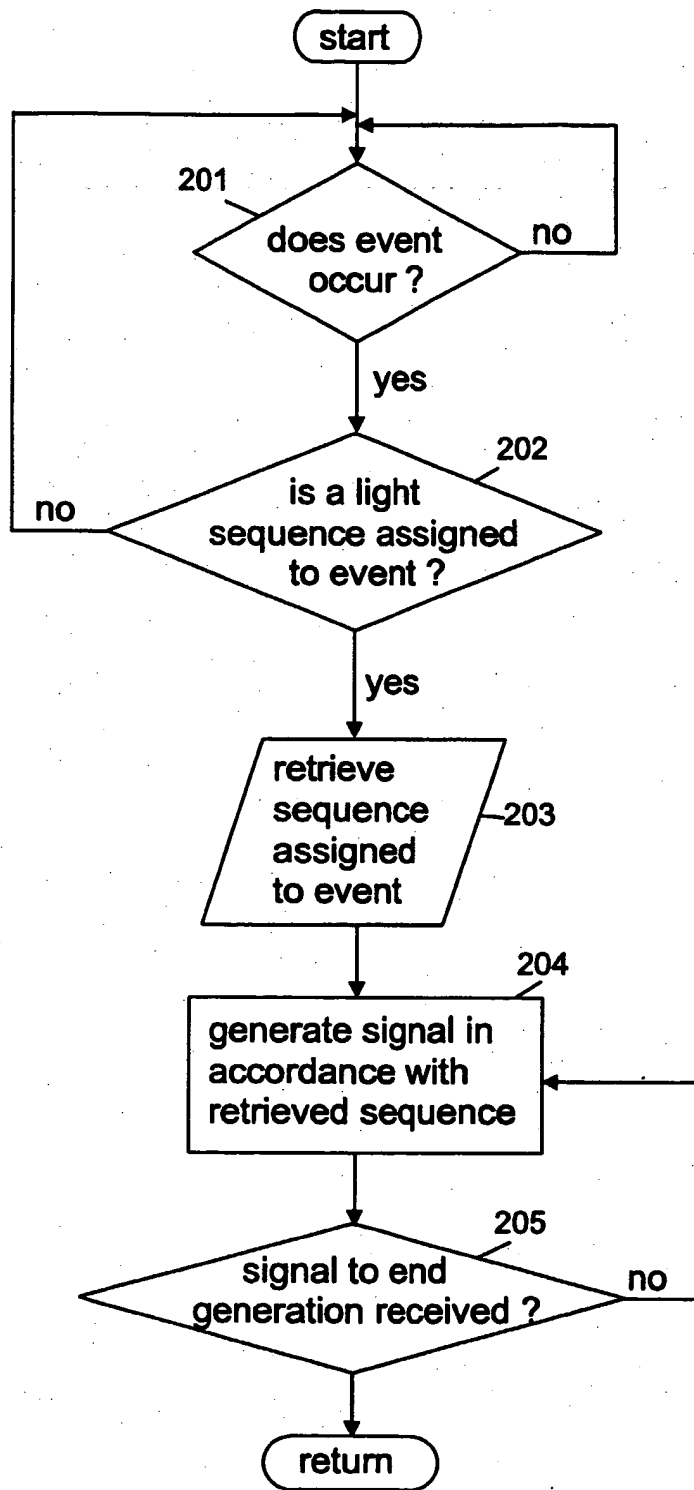
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*Fig. 1b*

*Fig. 1c*



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*Fig. 1d*

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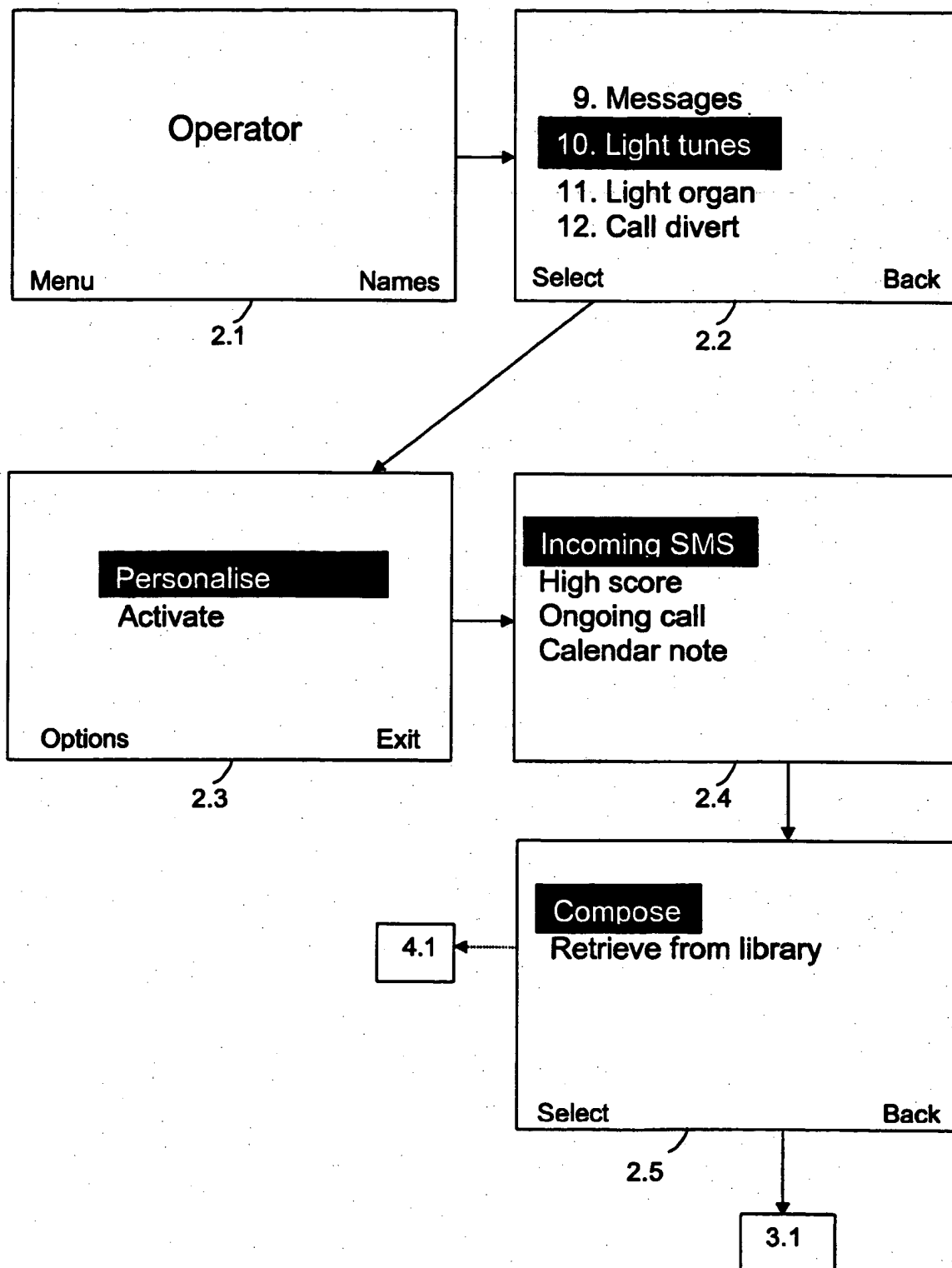


Fig. 2

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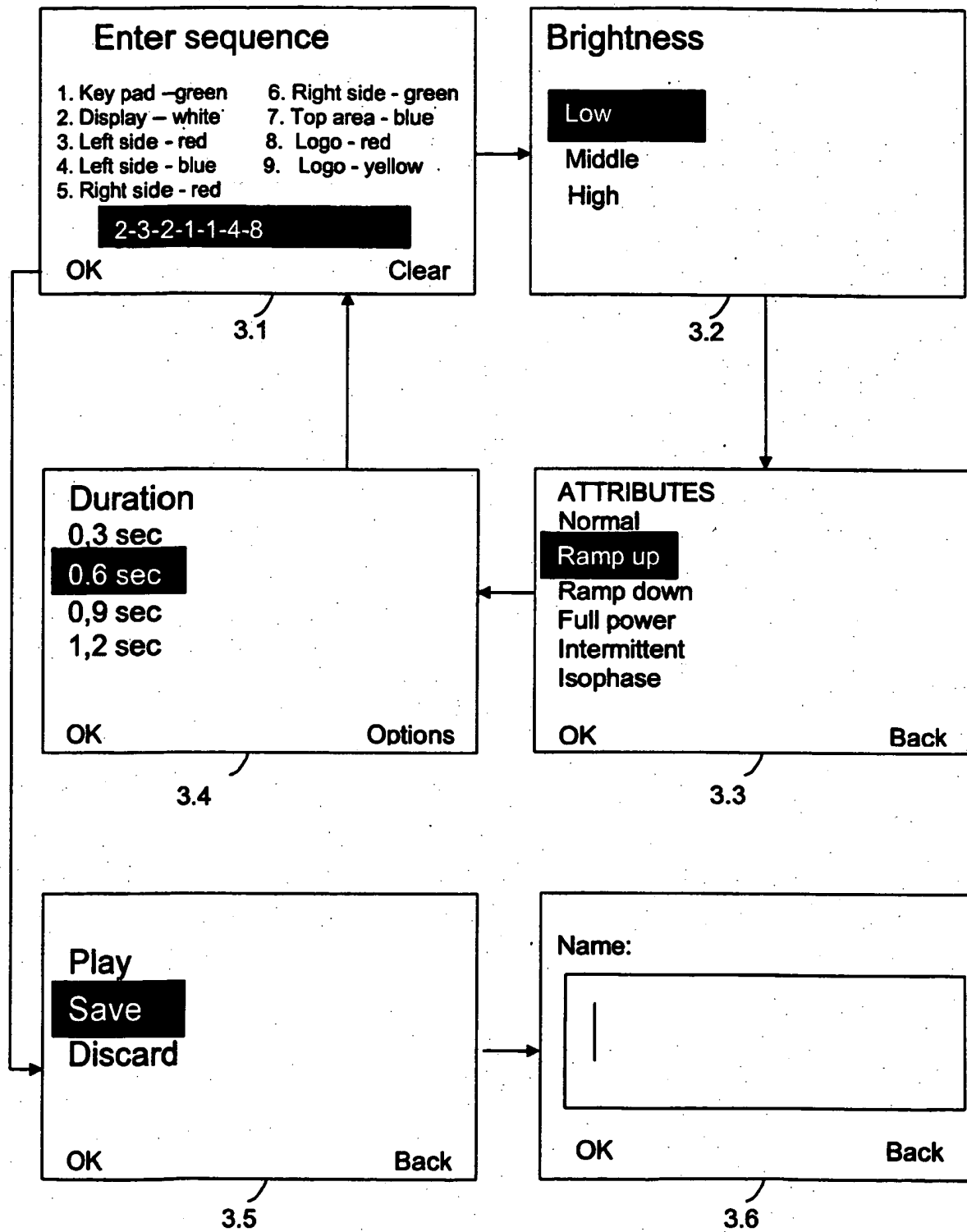


Fig. 3

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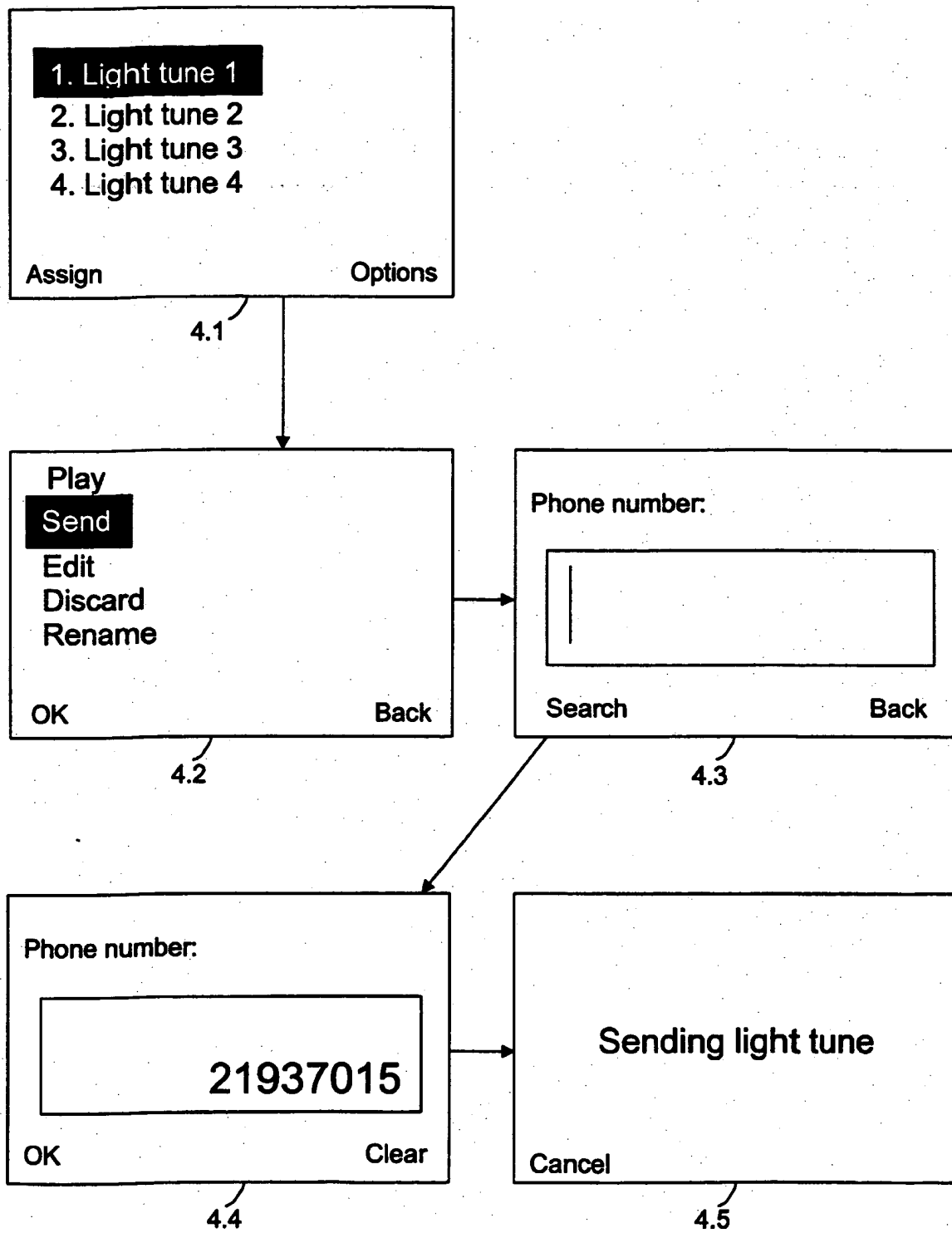


Fig. 4

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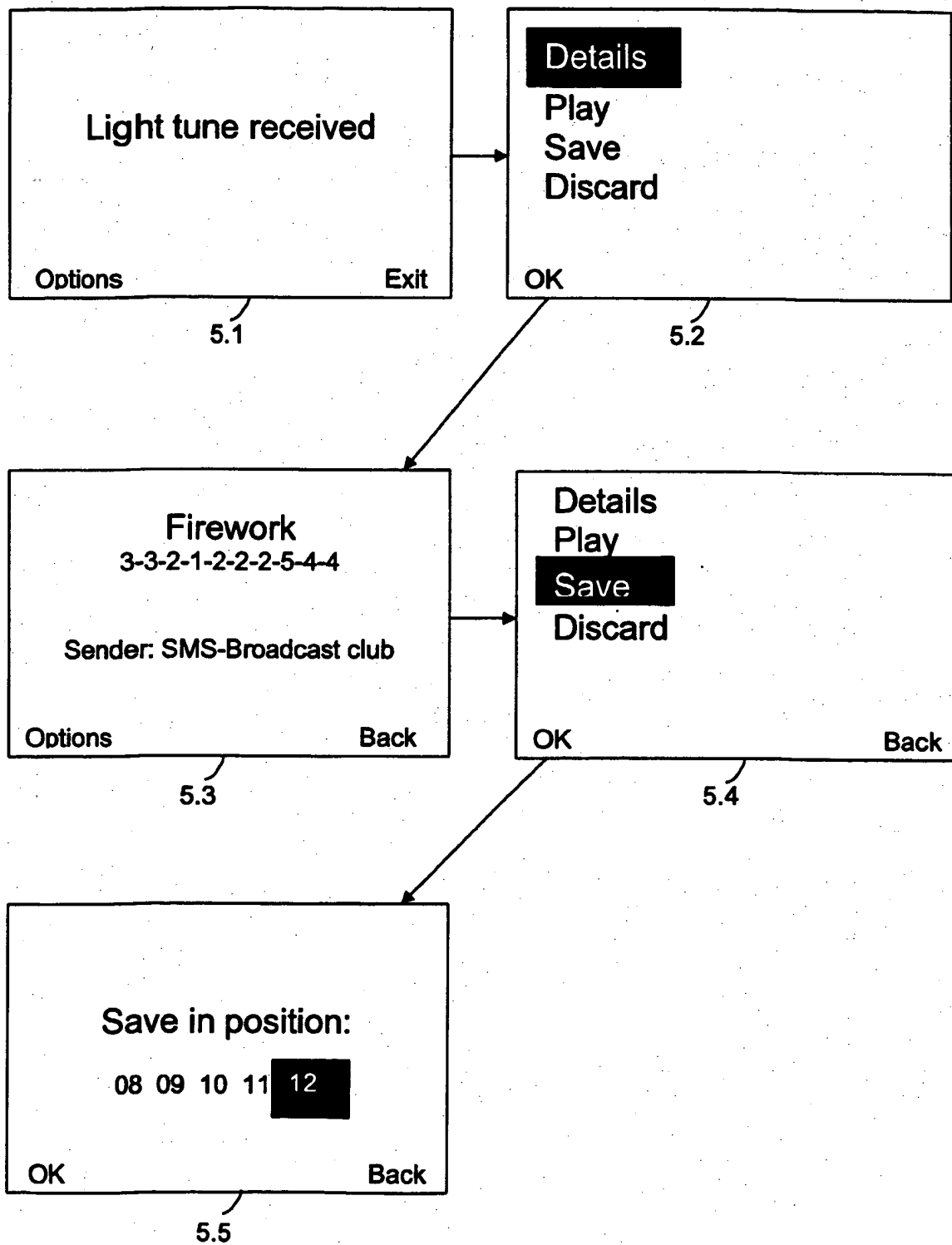


Fig. 5

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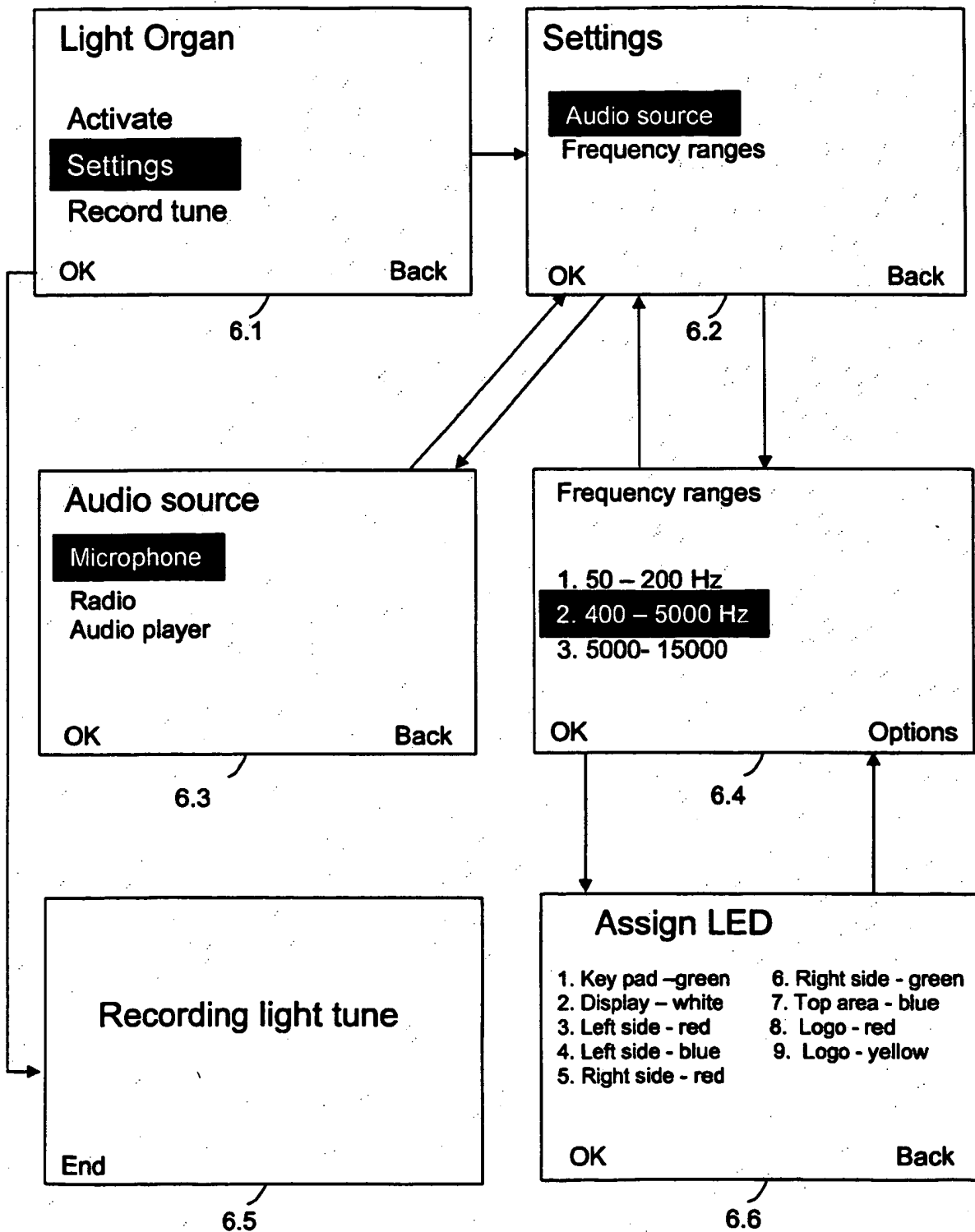


Fig. 6

[illegible]

# PCT

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**WO 2003/077505 A3**

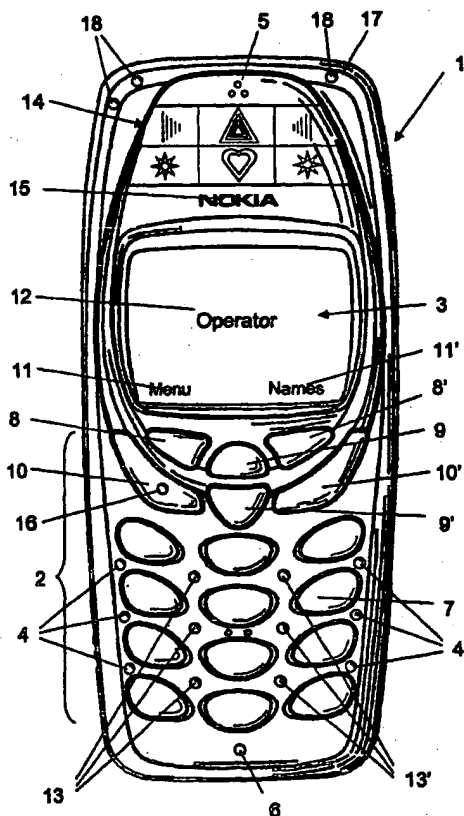
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*[Continued on next page]*

- (54) Title: MOBILE COMMUNICATION TERMINAL WITH PROGRAMMABLE LIGHTING SEQUENCES**



**(57) Abstract:** Mobile communication terminal comprising a plurality of lights, means for controlling the activation of the lights, means for storing a number of sequences of activation of the lights, and means for assigning one of the stored sequences of the activation of the lights to a particular event in the mobile communication terminal. The activation of the lights can also be related to an audio signal in order to obtain a so-called light organ functionality. Preferably the plurality of lights are integrated on a removable cover.

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European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,  
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,  
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,  
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

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### B. FIELDS SEARCHED

IPC 7 H04M

EPO-Internal, WPI Data, PAJ

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 946 636 A (UYENO S L ET AL) 31 August 1999 (1999-08-31) abstract column 2, line 18 - column 4, line 41 column 5, line 9 - line 39 figures 1-3,5	1-11, 19-28
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Y		14

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

\*T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

**"X"** document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

**"&" document member of the same patent family**

Date of the actual completion of the international search

**2 September 2003**

Date of mailing of the international search report

**15. 09. 03**

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## INTERNATIONAL SEARCH REPORT

Int

Application No.

PCT/EP 03/02478

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3 798 638 A (GOLDSCHMIED S F) 19 March 1974 (1974-03-19) abstract column 2, line 60 - line 63 column 3, line 1 - line 14 ----	14
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A	GB 2 361 798 A (KUSHITA M) 31 October 2001 (2001-10-31) cited in the application abstract page 6, line 23 - line 24 page 9, line 18 - page 11, line 10 page 12, line 4 - line 18 page 15, line 13 - line 18 page 21, line 13 - line 24 ----	1-11, 19-28
A	EP 1 168 775 A (RUCK S) 2 January 2002 (2002-01-02) abstract paragraph '0013! paragraph '0018! - paragraph '0019! paragraph '0026! - paragraph '0028! figures 1-3,7,9 ----	1-11, 19-28
Y	WO 97 44912 A (ANDREWS CRAIG A ;ERICSSON GE MOBILE INC (US)) 27 November 1997 (1997-11-27) abstract page 5, line 22 - page 6, line 21 page 7, line 17 - line 18 figures 2,3 ----	29-37
Y	WO 99 18590 A (ERICSSON GE MOBILE INC) 15 April 1999 (1999-04-15) abstract page 7, line 17 - page 8, line 2 page 8, line 25 - page 9, line 14 page 10, line 14 - line 20 figures 1-4 -----	29-37

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/EP 03/02478

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-28

A mobile communication terminal (independent claim 1) and related methods (independent claims 19 and 27) comprising:

- a plurality of light means,
- means for controlling the activation of the light means,
- means for storing a number of sequences of activation of the light means and
- means for selectively assigning one of the sequences of activation of lights to an event.

A mobile communication terminal (independent claim 12) comprising:

- a plurality of light means,
- means for controlling the activation of the light means and
- means for transforming an audio signal into a control signal for activation of the light means.

2. Claims: 29-37

A cover for removable attachment to a mobile phone (independent claim 29) comprising:

- a plurality of lights,
- a connector for establishing an electrical connection to a counterpart on the mobile phone and
- electric wiring connecting the connector with the plurality of lights.

Information on patent family members

International Application No.

PCT/EP 03/02478

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